



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventors: Peter G. Borden; Jiping Li  
Assignee: Applied Materials, Inc.  
Title: Measuring A Property Of A Layer In A Multilayered Structure  
Serial No.: 10/722,724 Filing Date: November 25, 2003  
Examiner: Rosenberger Group Art Unit: 2877  
Docket No.: BOX004-1C US Confirmation No: 7346

Santa Clara, California  
April 23, 2004

COMMISSIONER FOR PATENTS  
P.O. BOX 1450  
ALEXANDRIA, VA 22313-1450

**INFORMATION DISCLOSURE STATEMENT  
UNDER 37 CFR §1.97(b)**

Dear Sir:

Pursuant to 37 C.F.R. § 1.56, §1.97 and §1.98, the Applicants submit for consideration in the above-identified patent application the documents listed on the accompanying Form PTO-1449. Copies of references numbered 65-68, 76, and 79-117 are submitted herewith. The Examiner is requested to make these documents of record. Of the remaining references, the references numbered 1-64 are US Patents which are readily available in the U.S. Patent and Trademark Office. Moreover, references numbered 69-75, 77 and 78 are also not attached hereto, because these references were previously submitted in (and can be found in the file history of) the related patent application namely 09/095,805 now issued as US Patent 6,054,868.

**In addition, Applicants submit for the Examiner's consideration, the prosecution histories of the following co-owned applications/patents, cited by serial number, first named inventor and filing date.** The Applicants presume that the Examiner has access to and will review the cited applications/patents and the files thereof for any office actions, amendments or other materials that may be relevant to the patentability of the claims of the present application.

Citation of these prosecution histories (including the arguments against patentability advanced by Examiners in their respective Office Actions and the Applicants' arguments in

the corresponding Amendments) is in accordance with the recent case DAYCO PRODUCTS, INC. v. TOTAL CONTAINMENT, INC., 02-1497, decided May 23, 2003 by the Court of Appeals for the Federal Circuit. The Examiner is presumed to be knowledgeable about the current case law, including the above-mentioned Dayco case. However, if the Examiner needs a copy of the Dayco case, please call the undersigned. For any of the following U.S. patent application(s) that are currently pending, the Applicants further presume that the Examiner will consider any future office actions, amendments or other materials in the file thereof that may be relevant to the patentability of the claims herein. **If the Applicants' understanding in this regard is not correct, please notify the undersigned so that copies of any such documents can be submitted to the Examiner.**

	<b>Serial No.:</b>	<b>First Named Inventor</b>	<b>Date:</b>
1.	09/095,805	Peter G. Borden	06/10/1998
2.	10/269,619	Peter G. Borden	10/11/2002
3.	10/090,316	Peter G. Borden	3/1/2002
4.	09/521,232	Peter G. Borden	03/08/2000
5.	09/788,273	Peter G. Borden	02/16/2001
6.	10/253,121	Peter G. Borden	09/22/2003
7.	09/974,571	Peter G. Borden	10/09/2001
8.	10/090,287	Peter G. Borden	03/01/2002

This Information Disclosure Statement is submitted pursuant to 37 CFR §1.97(b) as it within three months of the filing date of a national application other than a continued prosecution application and/or before the mailing of a first Office Action on the merits. Accordingly, no fee is required.

Applicants would appreciate the Examiner initialing and returning the Form PTO-1449, indicating that the information has been considered and made of record herein.

The information contained in this Information Disclosure Statement is to the best of my knowledge and is not to be construed as a representation that: (i) a complete search has been made; (ii) additional information material to the examination of this application does not exist; (iii) the information, protocols, results and the like reported by third parties are accurate or enabling; or (iv) the above information constitutes prior art to the subject invention.

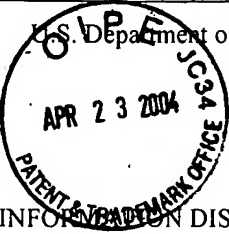
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Respectfully submitted,



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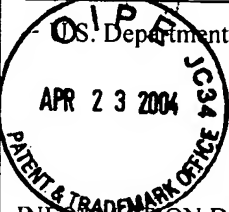
 <p>U.S. Department of Commerce, Patent and Trademark Office</p> <p>INFORMATION DISCLOSURE STATEMENT BY APPLICANT</p> <p>(Use several sheets if necessary)</p>	Application No.:	10/722,724
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	Group Art Unit:	2877
	Examiner Name:	Rosenberger
	Confirmation No.:	7346
	Attorney Docket No.:	BOX004-1C US

U.S. Patent Documents							
*Examiner Initials		Document Number	Date	Name	Class	Subclass	Filing Date if Appropriate
	1.	4,854,710	8/8/89	Opsal et al.	356	432	
	2.	6,489,801	12/3/02	Borden et al.	324	766	
	3.	5,966,019	10/12/99	Borden	324	752	
	4.	6,323,951	11/27/01	Borden et al.	356	502	
	5.	6,426,644	7/30/02	Borden et al.	324	765	
	6.	4,952,063	8/27/90	Opsal et al.	356	432	
	7.	5,042,951	8/27/91	Gold et al.	356	369	
	8.	5,042,952	827/1991	Opsal et al.	356	432	
	9.	5,159,412	10/27/92	Willenborg et al.	356	445	
	10.	5,181,080	1/19/93	Fanton et al.	356	381	
	11.	5,228,776	7/20/93	Smith et al.	374	5	
	12.	4,255,971	3/17/81	Rosencwaig	73	606	
	13.	4,579,463	4/1/86	Rosencwaig et al.	374	57	
	14.	4,632,561	12/30/86	Rosencwaig et al.	356	432	
	15.	4,636,088	1/13/87	Rosencwaig et al.	374	5	
	16.	4,750,822	6/14/88	Rosencwaig et al.	324	445	
	17.	6,049,220	4/11/00	Borden et al.	324	765	
	18.	6,483,594	11/19/02	Borden et al.	356	502	
	19.	5,652,716	7/29/97	Battersby	703	13	
	20.	5,761,082	6/2/98	Miura-Mattausch	703	14	
	21.	4,996,659	2/26/91	Yamaguchi et al.	714	736	
	22.	6,154,280	11/2/00	Borden	356	376	
	23.	6,054,868	4/25/00	Borden et al.	324	752	
	24.	5,883,518	3/16/99	Borden	324	752	
	25.	5,877,860	3/2/99	Borden	356	376	

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Date Considered:

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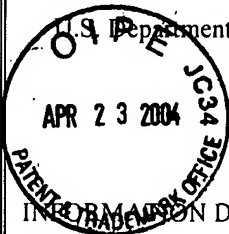
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26.	5,978,074	11/2/99	Opsal et al.	356	72	
27.	5,574,562	11/12/96	Fishman et al.	356	432	
28.	6,169,601	1/2/01	Eremin et al.	356	240	
29.	2002/0126732A1	9/12/02	Shakouri et al.	374	130	
30.	2003/0155927A1	8/21/03	Pinto et al.	324	501	
31.	6,489,624	12/3/02	Ushio et al.	250	559	
32.	6,486,965	11/26/02	Kim	356	626	
33.	5,741,614	4/21/98	McCoy et al.	430	30	
34.	6,327,035	12/4/01	Li et al.	356	432	
35.	5,454,004	9/26/95	Leger	372	99	
36.	6,281,027	9/28/01	Wei et al.	438	14	
37.	4,975,141	12/4/90	Greco et al.	156	626	
38.	6,395,563	5/28/02	Eriguchi	438	7	
39.	4,950,990	8/21/90	Moulder	324	224	
40.	5,667,300	9/16/97	Mandelis et al.	374	43	
41.	4,521,118	06/00/85	Rosencwaig	374	5	
42.	4,710,030	12/1/87	Tauc et al.	356	445	
43.	5,074,669	12/1/91	Opsal	356	447	
44.	3,909,602	9/30/75	Micka	235	151	
45.	5,430,548	7/4/95	Hirio et al.	356	394	
46.	5,764,363	6/9/98	Ooki et al.	356	364	
47.	5,790,251	8/4/98	Hagiwara	356	351	
48.	5,657,754	8/19/97	Rosencwaig	128	633	
49.	4,634,290	1/6/87	Rosencwaig	374	5	
50.	4,552,510	6/11/85	Rosencwaig	374	7	
51.	4,243,327	1/6/81	Frosch et al.	356	432	
52.	3,930,730	1/6/76	Laurens et al.	356	106	

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53.	4,455,741	6/26/84	Kolodner	29	574	
54.	4,468,136	8/28/84	Murphy et al.	374	45	
55.	4,466,748	8/21/84	Needham	374	129	
56.	5,408,327	4/18/95	Geiler et al.	356	432	
57.	4,795,260	1/3/89	Schuur et al.	356	400	
58.	6,559,942	5/6/03	Sui et al.	356	369	
59.	6,336,969	1/8/02	Yamaguchi et al.	117	7	
60.	6,528,333	3/4/03	Jun et al.	438	16	
61.	6,081,334	6/27/00	Grimbergen et al.	356	357	
62.	3,462,602	8/16/67	Apple	250	83	
63.	5,149,978	9/22/92	Opsal et al.	250	234	
64.	6,400,454	6/4/02	Noguchi et al.	356	237	

## 65. Foreign Patent Documents

							Translation	
		Document	Date	Country	Class	Subclass	Yes	No
	65	97/08536	06.03.97	WO	G01N	21/00		
	66.	2000009443A	1/1/2000	Japan	G01B			
	67.	05006929A	Jan-93	Japan	H01L	21/66		

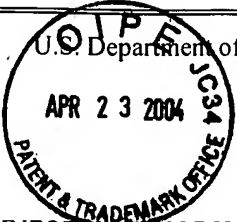
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68.	Intl Prel Search Report PCT/US03/29993
69.	Jackson, "Classical Electrodynamics", John Wiley & Sons, Inc., (month unavailable), 1967, pp. 222-226
70.	Schroder, "Semiconductor Material and Device Characterization", John Wiley & Sons, Inc. (month unavailable), 1990, pp2-20, 84-85, 232-235, 304-306, 364, 367-374, 378-383.
71.	Paquin, "Properties of Metals", Handbook of Optics, Vol. II, McGraw-Hill, Inc. (month unavailable), 1995, pp. 35.3-35.7
72.	Rosencwaig et al. "Detection of Thermal Waves Through Optical Reflectance", Appl Phys. Lett. 46, June 1985, pp1013-1015
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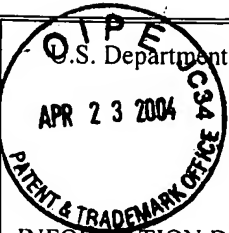
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74.	Opsal et al. "Thermal-Wave Detection and Thin-Film Thickness Measurements with Laser Beam Deflection", Applied Optics, Vol. 22, No. 20, Oct. 1983, pp. 3169-3176
75.	"Process Monitoring System," Quantox Product Brochure, 3 pg, prior to November 2003
76.	J. Opsal, "High Resolution Thermal Wave Measurements and Imaging of Defects and Damage in Electronic Materials" Photoacoustic and Photothermal Phenomena II, Springer Series in Optical Sciences, Vol. 62, Springer Verlag Berlin, Heidelberg, 1990.
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78.	C. Martinsons et al. "Recent progress in the measurement of thermal properties of hard coatings" Thin Solid Films, vol. 317, April 1998, 455-457.
79.	S. Wolf and R. N. Tauber, "Silicon Processing For The VLSI Era", Volume 1, 1986, pages 388-399
80.	Yaozhi Hu and Sing Pin Tay, "Spectroscopic ellipsometry investigation of nickel silicide formation by rapid thermal process", J. Vac. Sci. Technology, American Vacuum Soc. May/June 1998, pages 1820-1824
81.	Quality Today News, article entitled "In-Line Metrology SEM System with 3D Imaging" dated January 10, 2000 and published at <a href="http://www.qualitytoday.com/Jan-00-news/011000-3.htm">http://www.qualitytoday.com/Jan-00-news/011000-3.htm</a> before April 4, 2001
82.	Walter G. Driscoll and William Vaughan, "Handbook of Optics", 1978, pages 8-42, 8-43, 8-107, and 10-72 to 10-77
83.	Charles Kittel, "Introduction to Solid State Physics", Fourth Edition, John Wiley & Sons, published prior to March 1, 2002, pages 262-264
84.	Rolf E. Hummel, "Electronic Properties of Materials, An Introduction For Engineers", published prior to March 1, 2002, pages 137-145
85.	H.S. Carslaw and J.C. Jaeger, "Conduction of Heat In Solids", Second Edition, published prior to March 1, 2002, pages 64-66
86.	A. Rosencwaig, "Thermal Wave Measurement of Thin-Film Thickness", 1986 American Chemical Society, pp.182-191
87.	A. Rosencwaig et al., "Thin-Film Thickness Measurements with Thermal Waves", Journal De Physique, October 1983, pp. C6-483 - C6-489
88.	W. L. Smith et al. "Thermal-wave Measurements and Monitoring of TaSiX Silicide Film Properties" J. Vac. Technol.B2(4), Oct.-Dec. 1984, pp. 710-713
89.	A. Salnick et al., "Nonlinear Fundamental Photothermal Response in 3D Geometry: Experimental Results for Tungsten", (believed to be prior to March 1, 2002)
90.	S. Ameri et al., "Photo-Displacement Imaging", March 30, 1981, pp. 337-338
91.	L. Chen et al., "Thermal Wave Studies of Thin Metal Films Using the Meta-Probe-A New Generation Photothermal System" 25th Review of Progress in QNDE, Snowbird, UT 19-24 July, 1998, pp 1-12
92.	P. Alpern and S. Wurm, "Modulated Optical Reflectance Measurements on Bulk Metals and Thin Metallic Layers", J. Appl. Phys. 66(4), 15 August 1989, pp 1676-1679

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93.	J. Opsal, "The Application of Thermal Wave Technology to Thickness and Grain Size Monitoring of Aluminum Films", SPIE Vol. 1596 Metalization Performance and Reliability Issues for VLSI and ULSI (1991), pp 120-131
94.	A. Rosenwaig, "Process Control In IC Manufacturing With Thermal Waves", Review of Progress in Quantitative Nondestructive Evaluation, Vol.9, 1990, pp 2031-2037
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96.	B.C. Forget et al., "High Resolution AC Temperature Field Imaging", Electronic Letters 25th September 1997, Vol. 33 No. 20, pp 1688-1689
97.	C. Paddock et al., "Transient Thermoreflectance from Metal Films", May 1986 Vol. 11, No. 5 Optical Letters, pp 273-275
98.	C. Paddock et al., "Transient Thermoreflectance from Metal Films", J. Appl. Phys. 60(1), 1 July 1986, pp 285-290
99.	Per-Eric Nordail et al. "Photothermal Radiometry", Physica Scripta, Vol. 20, 659-662, 1979
100.	A. Rosenwaig, "Thermal Wave Monitoring and Imaging of Electronic Materials and Devices", pp 73-109
101.	A. Rosenwaig, "Applications of Thermal-Wave Physics to Microelectronics", VLSI Electronics, Microstructure Science Vol. 9, 1995, pp 227-288
102.	W. Lee Smith et al., "Voids, Notches and Microcracks in Al Metallization Detected by Nondestructive Thermal Wave Imaging", June 23m 1989, pp. 211-221
103.	W. Lee Smith et al., "Imaging of Subsurface Defects in ULSI Metalization (Al Voids SI Precipitates, Silicide Instability) and SI Substrates (D Defects), Technical Proceedings Simicon/Japan 1992, Nippon Convention Center, Japan pp 238-246
104.	W. Lee Smith, "Nondestructive Thermal Wave Imaging of Voids & Microcracks in Aluminum Metallization", 1989 WLR Final Report, pp 55-68
105.	W. Lee Smith, "Direct Measurement of Stress-Induced Void Growth by Thermal Wave Modulated Optical Reflectance Imaging", 1991 IEEE/IRPS, pp 200-208
106.	W. Lee Smith, "Evaluating Voids and Microcracks in Al Metalization", Semiconductor International, January 1990, pp 232 -237
107.	C. G. Welles et al., "High-Resolution Thermal Wave Imaging of Surface and Subsurface Defects in IC Metal Lines", Materials Research Society, SF Marriott, April 27-May 1, 1992, pp 1187-1191
108.	L. Fabbri et al., "Analysis of Local Heat Transfer Properties of Tape-cast AlN Ceramics Using Photothermal Reflectance Microscopy", 1996 Chapman & Hall, pp 5429-5436
109.	J. A. Batista et al., "Biased MOS-FET and Polycrystalline Silicon Tracks Investigated by Photothermal Reflectance Microscopy", pp 468-469
110.	L. Chen et al., "Meta-Probe: A New Generation Photothermal System For Thin Metal Films Characterization" (believed to be prior to March 1, 2002)
111.	L. Chen et al., "Thermal Wave Studies of Thin Metal Films and Structures", (believed to be prior to March 1, 2002)

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